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factors in terms of the group—its cumulative tradition and creative life. The real causes or motives must be found in the life history of the individual, as woven into the social network of relations at a specific cross-section of the history of the group. We can not say that this particular condition of the environment or this particular tendency effected such and such results, but we must take account of this condition or tendency as part of an organization of life interests with its social pressure, system of beliefs and scale of values. The particular factors must be regarded as instruments, conditions, raw material for social construction. The process, in other words, must be regarded, not as a mechanical but as a teleological process—the factors having meaning and efficiency only as they enter into the creative synthesis of group realization. We must take account of group participation, not as a mere effect, but as an independent variable, and for sociology the most significant variable. We find that other factors may vary and yet group relations remain the same. And on the other hand we find that group relations may vary while other factors remain the same.

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REVIEWS AND ABSTRACTS OF LITERATURE

An Enquiry Concerning the Principles of Natural Knowledge. A. N. WHITEHEAD. Cambridge University Press. 1919. Pp. xii + 200.

This is a book of real importance, but it is not a book for everybody. There are pages filled with definitions of queer technical terms, and there is no index, but that is not what makes it hard reading. The difficulty lies in the thought. You need some mathematical training to read the book, and you need some acquaintance with the previous writings of the author, or the related writings of Mr. Bertrand Russell. But far more than these, you need a sense of the whole movement of modern physical science, and an imagination undaunted by four-dimensional manifolds interweaving with other four-dimensional manifolds. In short, we have a book here which ought to be read by every philosophy student interested in metaphysics or in the philosophy of nature, but a book which most students of philosophy are not competent to read.

The subject of the enquiry is stated to be "geometry as a physical science," or "how is space rooted in experience?" And its fundamental thesis is that the verifiable data of physical science extend temporally as well as spatially. All nature can, and indeed must, be analyzed into a complex of time-filling and space-filling events. It is therefore assumed that certain so-called "mathematical" objects, such as points of space and instants of time, do not exist. Or rather, proof is advanced that we can get along without assuming that they exist, and can still have a mathematics applicable to nature. Professor Whitehead does not argue that points and instants are unperceivable and therefore unreal. His argument takes the more effective form of establishing that points and instants are introduced only in a certain type of analysis of nature, which analysis is then shown to be inadequate. "We can not express the facts of nature as an aggregate of individual facts at points and at instants" (p. 24). Thus it happens that no addition of points together will produce a length; if you start with points, lengths must be introduced as something additional. But you could get the equivalent of points out of lengths by a suitable construction in the reverse direction.

The method of avoiding the assumption of points and instants is not so much debated in the present book, as it is assumed to be valid and then developed; the discussions which occur here of this "method of extensive abstraction" are concerned with the details of technique. The method consists essentially in taking the class of all the space-time volumes that would include a certain supposed point at an instant, and do not all include any other point or instant, arranging these in approximation series that are mutually equivalent in that they all, as they grow smaller and smaller, approximate towards the supposed point, and then taking the set of such equivalent series as a substitute for the supposed instantaneous point. It is somewhat as if, to use an over-simplified example, one took the series of all circles having their center-point in common as being an equivalent for the center itself. One would then translate geometry into a form that omitted the mention of points: instead of saying "the line passes through this point," one would say "the line cuts all these circular areas." Each circle has a finite area; the center-point has no finite area. But there is a unique one-one relation between the set of circles and their common center. So we can employ a class of areas as a sort of substitute for the non-area which is their limit; and thus simplify metaphysically, by being able to say that all space-things have areas. But of course, in the ways in which these space-things are put together there is a great increase of complexity, especially since lines and areas must next be translated into sets of volumes, and so on. Our motive here is obviously not a pragmatic search for economy of thought, but a metaphysical ideal of economy of assumption, as regards the introduction of new sorts of irreducible metaphysical entities.

Professor Whitehead calls attention to an analogy with the differential calculus. There is no physical meaning to a velocity at an instant. Yet we can study the average velocity over three seconds, over two seconds, over one second, over half a second, *etc.*, and we can then infer that, at the instant, a certain number would represent with great precision the velocity of the body at that instant. The number is more precise than the values of the separate members of the series from which it came, since the velocity for a second is often only an average of various velocities during parts of the second. Yet the velocity at an instant is, nevertheless, no velocity at all; a perfectly instantaneous photograph would not show the body in motion. The formerly employed explanation was that the velocity in question was over an infinitesimal time; and then we had metaphysical problems about what were these "ghosts of vanished quantities." But there are no infinitesimals. The "velocity at an instant" is not a velocity, though it is the limit of a series of velocities over diminishing finite times. We could use the set of all such series, equivalent in that they are all diminishing towards the same instant, as the "velocity at the instant," but since they all have the same number which is their limit as series, this number, though lying outside of each and all these equivalent series, may be used as answering the same purpose, when we are calculating the course of behavior of a body. That is to say, the numbers have among them one number which is the limit of the series of numbers representing the velocities, though the velocities themselves do not have a limit which is a velocity. If we were dealing with velocities in the concrete, the only equivalent we could give for a velocity at an instant would be the entire set of series of actual velocities approximating to it. This is what we have to do when analogously we seek existent substitutes for non-existent "mathematical" points.

Certain difficulties seem still to lurk in the method. For instance, the approximation series must be infinite. In our series of concentric circles there is no circle that does not have within it a still smaller circle. But an actual infinite is no less inexperienceable, unverifiable, than is a mathematical point. There is something here, in any case, that can be reached only by thought. Moreover, in the present discussion at least, the areas and volumes seem to be assumed to be sharply bounded, without that penumbra of vagueness which blurs the outlines of every experienced figure. When we recall that such a penumbra of vagueness must itself have indefinite boundaries, and so on, then we see that, no matter how we handle these figures, we use a thought that far outruns the verifiable. How complicated does the equality of two lengths become, when neither length begins or ends in a point! Wonderfully ingenious this theory will have to be—till we begin to wonder whether the game is not being made endlessly intricate for no deeper reason than to show the skill of the player?

But there are other topics in Professor Whitehead's book, and we can not exhaust any one of them here. Perhaps the most central discussion is one concerning the contrast of events and objects. What relation does the analysis of the world into a stream of events have to the ordinary analysis into objects, whether perceived physical things, such as houses and trees, or scientific objects, such as electrons? The answer is naturally complex. The two sorts of analysis overlap, yet neither is exhaustive. Let us first quote some relevant passages. "Events are essentially elements of actuality" (p. 61); they "can never happen again;" "events never change," though they give place to other events; "the irrevocableness of the past is the unchangeability of events." The most fundamental relation among events is that of inclusion-exclusion, or part-whole. Objects, on the contrary, do happen again; they reappear; they are correlated with the physical act of recognition. Indeed, Professor Whitehead concludes that they are not so much permanent in time as out of time altogether. What is in time is the set of events correlated with a given object. Yet also, though objects are out of time and space, they are, nevertheless that which has possibilities, that is to say, has potentialities. "Whenever the concept of possibility can apply to a natural element, that element is an object" (p. 64). As regards part-whole relations, "it is an error to ascribe parts to objects," either temporal, as if the table today were part of the total table, the table to-morrow another part; or spatial, as if the leg of the table were part of the table. The having spatial and temporal parts is peculiar to events. "Time and space, which are entirely actual and devoid of any tincture of possibility, are to be sought for among the relations of events." "The chief confusion between objects and events is conveyed in the prejudice that an object can only be in one place at a time. That is a fundamental property of events" (p. 65). "The continuity of nature is to be found in events, the atomic properties of nature reside in objects" (p. 66).

The term "event" lays emphasis on the time-covering character of the actually existent. Nevertheless, this tapestry of events, stretching away into past and future, absolutely actual, related only by relations of inclusion-exclusion, is almost the antithesis of temporality. Physicists and philosophers are alike in their deep-seated desire to view the world "under the aspect of eternity." Professor Whitehead has tried to avoid such a tendency by making references to action and creative advance. But somehow the creative flow of the present becomes superficial in the course of the analysis, becomes a chance shadow that flits across the fixed tapestry of events. As physicist you abstract; true enough, but Professor Whitehead's own inquiry is precisely this, How may we bring physics into closer contact with natural fact? Now any easy device of letting time slip out of the picture is not masterly; and time includes not merely temporal extensity, but also the actuality of change. Perchance we philosophers pride ourselves on eternity because we can not bring our feeble minds to think squarely and heartily in terms of time, in terms of this treacherous, ever-slipping ever-advancing movement, that seems the very stuff out of which our lives are made; can not bring ourselves to think in terms of potentialities, of possible occurrences and things unborn, of hopes and uncertainties and the open road. "To realize the unimportance of time," says Mr. Bertrand Russell, "is the gate of wisdom." Yes, of a certain moral wisdom, perhaps; but why *these* moral judgments introduced into the consideration of the world as it seems to be? Even M. Bergson, with all his lip-service to change, turns for the essence of mind to memory, to memory which gives us the now silent panorama of the past; and for his ideal of God, to an ideal Vision, which like Professor Royce's Absolute, might command all time at once, in one world-inclusive moment. Let us not attribute this tendency to the nature of intellect, or to the spatializing of time. No, these are at most only symptoms. The fault, if it be a fault, lies in our fear and bewilderment before this dizzy, whirling, vanishing world as it is.

There is a clarifying virtue in the very sharpness of Professor Whitehead's distinctions between the world as a set of events, and the same world as various different sets of things, making no one analysis exhaustive of all aspects, and apportioning certain concepts to one analysis, certain to another. This is true, even though the distinctions first made may not prove finally tenable. The apportioning of time to events and timelessness to things is a case in point. So also is it with the ascription of possibility to things. It would be better perhaps, though more commonplace and hence less suggestive, to have said that the temporal characters prominent in things are different from the temporal characters prominent in events, though things be considered as merely certain systems of events. It would be better to say that you can talk, in one sense, of a possible event, but not of an event's having possibilities, for only things have potentialities. Since we recognize a thing, an object, as the same in new situations, it has, in this respect, characters similar to universals. So it becomes easy to generalize, and say of things what we ordinarily say of universals, that they are timeless and have no parts. But perhaps it would be better not to stretch the analogy too far. Professor Whitehead's paradoxes are largely verbal, and behind them lie some really significant distinctions, distinctions which it would be a pity to lose in any verbal quarrel or novel convention about language usages.

One of the most baffling problems of distinguishing between the verbal or conventional and the real is presented by the recent scientific theory of relativity. Professor Whitehead's entire work has been at every step influenced by these theories, and his own specific discussions of Einstein and of the curious arbitrariness of selecting light signals as the basic way of determining simultaneities, are among the best philosophical criticisms of relativity that have yet appeared. Professor Whitehead does not discuss the generalized relativity theory, but introduces in his own geometry Euclidean and continuity postulates. Also he does not make it clear, any more than does Einstein himself, precisely how the famous Newtonian argument for absolute space, from the phenomena of rotation, is answered by the relativist.

Professor Whitehead's own analysis would apparently and naturally lead him—though here we depart somewhat from his specific statements and deal with what seem to be unnoted implications—to a distinction between the space of events and the space of things—or rather, spaces of things, for not only are there various sorts of objects, but confining ourselves, for the moment, to ordinary physical objects, there are, if we consider space to be nothing but a relation between objects, different spaces for different sets of objects, as Professor Whitehead himself remarks, and an object which is standing still in one space is moving in another. Apparently, the space of events, or space-time of events, is one aspect of the events themselves, namely their extensity. According to Professor Whitehead, it constitutes an all-inclusive plenum, and if we limit ourselves strictly to events, the only possible geometry would seem to be a sort of "analysis situs" of inclusion-exclusion, curiously reminiscent of Aristotle's long-neglected theory that space is essentially a relationship of container and contained. It would seem, however, that without introducing objects, this space-time of events could not have any metrical properties, such as lengths. Fixity of units of length would involve recognition of sameness. The event-manifold is a "jelly-fish world," where no units are suggested, for there are no rigid bodies. But neither would there be simultaneity of remote events. The supposition that there would be simultaneity, and hence "moments of time," is apparently tacitly introduced by Professor Whitehead. Yet the interconnection of simultaneity and units of length is one of the most central theses of the theory of relativity. The metrical structure is something new, independent, external, laid down over the manifold of events and fitting it somewhat loosely.

The Bergsonians inform us that needs of action have impelled us to try to fixate the fluidity of events by superimposing rigid mathematical forms. The situation seems nowadays almost the reverse: we are trying to measure given extensities with india-rubber yardsticks. These yardsticks are still comparable, since they vary according to law; but the law is their own law, and not one necessitated by the events to be measured. I measure a moving train, and discover it has "become shorter" as it moved. The passenger on the train replies that the train is just as it has always been, the discrepancy originated through my laying my measuring-tape on the front end of the train just a moment before I laid it on the back. Simultaneity and length are thus curiously interwoven by the relativity theory, but both are relative and comparative, and are superimposed on an extensity which is somehow absolute. A man in Washington, D. C., may quarrel over the telephone with a man in St. Louis, one declaring it is eleven o'clock, and the other that it is ten o'clock. Obviously, they are quarreling about the same time, and their quarrel is a verbal one concerning what name they are going to call "it" by. But the verbal quarrel is not purely verbal; it is based on a difference, not in the identity of the moment of time under dispute, but in the standard of comparison. Just so, the train has a certain absolute extensity. Otherwise there would be no question raised. But the instant there is an attempt to compare this extensity with other extensities, we have a difference of standards of comparison on our hands. There is not merely the obvious arbitrariness due to conventionality in selecting a particular yardstick; and not merely an idealization which creates for us a perfect "unchanging" Dr. Jekyll of a yardstick, despite the Mr. Hyde characteristics of actual physical yardsticks, infected as they are with what Professor Whitehead calls the "incurable vagueness" of all physical objects, plus some additional faults peculiar to yardsticks; but in addition, the very process of measuring involves new complications, so that there is more than one result possible even where you measure the same thing with the same yardstick. Would we could be naïve again, like the Bergsonians, and make a simple and rigid mathematics after our own wishes, instead of this Frankenstein's monster of a mathematics, that grows exuberant according to a will of its own!

Let us not be misled into supposing that mathematics is really growing less rigorous. Let us recognize the stern and stubborn precision of these novel mathematical-physical theories. But let us recognize that the mathematics popular among philosophers seems on the verge of joining other primitive mythologies. Philosophers tell us that Spinoza, for instance, tried to put his philosophy into mathematical form, with evident axioms and certain deductions. But the mathematical logicians have shown that self-evidently true axioms are no part of mathematics, and more than that, that the whole deductive-system-form is a device of exposition rather than the essence of mathematics. Philosophers have expatiated on the perfect simplicity of the "mathematical objects," these being numbers, or triangles, or mathematical points. But under Mr. Russell's analysis that Platonic world of numbers has disappeared; and now, under Professor Whitehead's analysis, the mathematical points and triangles are disappearing. Mathematics, bereft of everything that made it mathematics in the eyes of the philosophers, from axioms to infinitesimals, from triangles with angles necessarily equal to two right angles, and pairs of straight lines that can not enclose a space, to the contradictions of infinity and the independence of applied geometry from the empirical arrangements of matter—bereft of all these, mathematics goes on, greater and more triumphant than ever. When predictions based on a new use of non-Euclidean geometry recently made it possible for the first time to compare non-Euclidean and Euclidean geometry as applied to physical space, and Euclid lost, then even the man in the street heard something had happened, and was perplexed to understand it from the expositions given by our good professors of mathematics and astronomy, who had themselves been caught napping, expositions about as intelligible in most cases as the shout of the newsboys calling an extra. Everyone knew something had happened, but neither philosophers nor physicists were sure just what it was. They had suddenly been brought face to face with the startling possibility that those eccentric speculations on non-Euclidean geometries and the foundations of mathematics might somehow or other become the gateway to the science of the future, and the prospect was bewildering. Perchance some of them will now even try to read Mr. Whitehead's book—and we fear they will fail!

Professor Whitehead's book covers two hundred pages of big print. A really adequate review of the book would possibly occupy four hundred pages. Professor Whitehead has raised more questions than he has settled, felt the existence of problems he has not thought out. He has crowded into the closing chapters suggestions enough for another book—suggestions about causes and about the relation of geometrical figures to sense, and about rhythms, including those queer rhythmic temporal structures called by the general name, ''life.'' The present review might attempt to give neat little summaries of these, but we shall not. For then we should probably leave out the most valuable aspect of the discussion, its suggestiveness; and some reader of this review might suppose he knew the contents of Whitehead's book without reading it, and so continue to live in ignorance and self-approbation. If Professor Whitehead ever comes to perfect clearness about all the topics raised in this book, he will write another book that will be one of the great masterpieces of modern philosophy.

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Free Trade, the Tariff, and Reciprocity. F. W. TAUSSIG. New York: The Macmillan Co. 1920. Pp. ix + 219.

Professor Taussig, the former chairman of the United States Tariff Commission, has in this book gathered together a number of addresses and papers dealing with various aspects of the tariff controversy. The volume is characterized by more of unity than usually attaches to such a collection, and the reader will find in it a coherent, consistent presentation of the author's views on the main issues of the tariff question.

Mr. Taussig states his position in the opening essay. ''The essence of the doctrine of free trade is that *prima facie* international trade brings a gain, and that restrictions on it presumably bring a loss. Departures from this principle, though by no means impossible of justification, need to prove their case, and if made in view of the pressure of opposing principles they are matter for regret. In this sense the doctrine of free trade, however widely rejected in the world of politics, holds its own in the sphere of the intellect'' (p. 33). With force and clarity Mr. Taussig develops this thesis. In the course of his discussion he disposes of many of the popular fallacies concerning the advantages of protection which, many times refuted, still remain in circulation. Most illuminating is his treatment of ''How tariffs should not be made,'' in which certain intimate and interesting details of tariff-making are revealed.

The final essay in the collection deals with the situation to be faced by the United States with the conclusion of peace. In a time marked by the uncertainties and confusions which characterize domestic conditions and foreign relations to-day, it is not surprising to find the author chary of dogmatism as to the future course of events. Upon the character of the ultimate peace depend the commercial relations and economic policies of the great powers. And